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S P E C I F I C A T I O N

OF

JOHN ISAAC HAWKINS.

ADMINISTERING GALVANIC INFLUENCE
INTO THE HUMAN BODY.

L O N D O N :

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Administering Galvanic Influence into the Human Body.

HAWKINS' SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN ISAAC HAWKINS, of Pancras Vale, in the Parish of Saint Pancras, in the County of Middlesex, Civil Engineer, send greeting.

WHEREAS His present most Excellent Majesty King William the Fourth, by His Letters Patent, under the Great Seal of Great Britain, bearing date at Westminster, the Thirteenth day of March, in the fourth year of His reign, did, for Himself, His heirs and successors, give and grant unto me, the said John Isaac Hawkins, His especial licence, full power, sole privilege and authority, that I, the said John Isaac Hawkins, my exors, admors, and assigns, or such others as I, the said John Isaac Hawkins, my exors, admors, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, the Town of Berwick-upon-Tweed, the Invention of "CERTAIN IMPROVED INSTRUMENTS FOR FACILITATING THE CURE OF DISEASE BY ADMINISTERING GALVANIC INFLUENCE INTO THE HUMAN BODY," communicated to me by the Inventor, Daniel Harrington, a foreigner residing at Philadelphia, in the United States of North America; in which said Letters Patent there is contained a proviso that I, the said John Isaac Hawkins, shall cause a particular description of the nature of the said Invention, and in what manner the same is to be performed, to be inrolled in His said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in part recited Letters

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Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said John Isaac Hawkins, do hereby declare that the nature of the said Invention of "Certain Improved Instruments for facilitating the Cure of Disease by 5 Administering Galvanic Influence into the Human Body, as communicated to me by the said Inventor, is fully set forth, and the manner of carrying the same into effect clearly explained, in the following description thereof, reference being had to the Drawings hereunto annexed, and to the Letters and Figures herein contained, as compared with the same Letters and Figures marked on 10 the Drawings, that is to say:—

The said Daniel Harrington having by long observation discovered that galvanic influence or galvanic electricity acts more beneficially in the cure of disease when applied to the human system with a slight degree of intensity excited only by the natural fluids of the body than when made to operate 15 with great power by means of batteries or voltaic piles forced into violent action by acidulated liquids; and has also discovered that although the cuticle or scarf skin is an imperfect conductor of galvanic electricity, yet on being pressed closely upon the cutis vera or true skin, the influence is more freely transmitted through the cuticle to the nerves, stimulating them to beneficial 20 action in removing the causes of disease; and in consequence of these discoveries has exerted himself with great diligence and skill to the production of various instruments calculated for administering the galvanic influence gently to the external surface, and into the natural orifices, apertures, passages, hollows, recesses, or cavities of the human body, namely, into the ears, nostrils, 25 mouth, stomach, navel, vagina, urethra, bladder, rectum, or armpits, or into artificial apertures made by puncturation of the cuticle, and also into depressions or indentations made by the pressure of blunt points or small surfaces upon the cuticle.

Descriptions of these instruments, and the modes of constructing them, 30 having been communicated to me by the said Daniel Harrington, I hereby declare the Invention claimed under the present Letters Patent to consist of the various instruments herein-after described, compounded of silver and zinc, or of copper and zinc, or of any two differently oxidable metals or metallic alloys, by which galvanic influence is excited, the said instruments being re- 35 spectively so variously constructed as to convey the mild galvanic influence in a convenient manner into or near upon the parts of the body on which it is desirable to operate; some forms of these instruments being also made into hollow vessels for the purpose of holding warm water whereby the parts of

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the body operated upon may be raised in temperature and thus brought into a state still more favourable for the reception of the electric action than in the state of ordinary bodily heat. The Drawings hereunto annexed shew several forms of instruments for the said intention, adapted to various orifices, 5 apertures, cavities, and superficies of the body, and the following description explains those Drawings, and also describe some other forms, of which elucidatory Drawings could not easily be given, but the construction of which are clearly explained by words.

Fig. 1 represents the simplest form of the Invention ; being a plate of silver 10 and a plate of zinc soldered together edge to edge, forming one compound plate of two metals. *s*, the silver ; *z*, the zinc. This instrument when made of the length and breadth shewn in the Drawing, and about the one hundredth part of an inch thick, this is to be placed in the mouth upon the gums for the cure of tooth-ache, being first bent to fit the curve of the jaw ; and when 15 made of a larger size, say from two to four inches long and wide by one fiftieth of an inch thick, with the surface a little curved, will prove a convenient instrument to be laid with the concave side on a swelled or pained ancle, or any other protuberant part of the body upon which it can be tightly bound, in order to stimulate the nerves of the part to a more healthy action, and aid 20 in the cure of local disease.

Fig. 2 shews an elongated form of the two plates, which, instead of being soldered together, are laid one overlapping the other and tied together so that the instrument may be varied in length at pleasure, in order that the faces of the extremities, distinguished by the term discs, may lie on distant parts of 25 the body, the dimensions of course depending on that distance and on the magnitude of the parts of the body to be operated on, and for the convenience of tying or binding the parts of the instrument overlapping each other, distinguished by the term arms : the arms may be made narrower than the discs, as shewn in the Drawing. The instrument therefore consists of a disc and arm 30 of silver, and a disc and arm of zinc, bound together by the arms. A, a flat view ; B, an edge view ; *s*, silver ; *z*, zinc ; *a*, string. The arms in contact with each other may be wrapped all around with silk, woollen, or other cloth, in order to insulate them from the body of the patient, and cause the electric circulation to pass through the instrument, and through the parts of the body 35 lying between the discs. When the discs are to lie upon the protuberances the faces of them may be concave and smooth, when on flat but firm parts the faces may be flat and smooth, when on hollow parts the faces may be convex ; but when on very soft parts, then the faces should be formed into a number of blunt points or small protuberant surfaces, so that great pressure may be given

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upon many places of the cuticle at once without the whole pressure being inconvenient, and thus that the galvanic influence may be readily transmitted into the nervous system through the compressed cuticle.

Fig. 3 shews a view and profile of a flat face, having pointed elevations made by filing a number of grooves crossing each other, converting the whole 5 face into a great number of pyramids. In this case, the discs might well be made about one sixteenth of an inch thick, soldered on to arms of the hundredth part of an inch or less in thickness, so that they may be easily bent to bring the faces in proper contact with the required surfaces of the body. For the sake of economy the silver disc may have a copper arm, since 10 it is covered with cloth and does not come in contact with the skin of the patient. A, a view of the face; B, section through a line of pyramids; *a*, the disc; *b*, a portion of the arm. Another mode of producing a number of elevations on the face of the disc is, to make it about one hundredth part of an inch thick, and lay the face on the end grain of a block of wood, and then, 15 with a conical steel point or centre punch, make a number of indentations at the back of the disc; and the same number of blunt conoidal points will be raised on the face; C, section through a line of indentations. Alternate elevations and depressions may also easily be formed by making a number of holes of about a quarter of an inch diameter and about a sixteenth of an 20 inch apart, in a thin plate of silver, and tying or rivetting the same upon a plate of zinc; or by making the holes in a thin plate of zinc, and tyeing it on upon a silver plate. D, a view of a perforated silver plate tyed on to a zinc piece. One such pair of plates may also form a complete instrument by itself; *s*, silver; *z*, zinc; *a*, string. Tyeing will have this advantage over rivetting, that 25 the plates may easily be separated to be cleaned.

Fig. 4 represents one end of an instrument similar to Fig. 3, except that to the disc a hollow vessel is affixed capable of holding warm water. A, side view; B, edge view; *a*, the vessel; *b*, the cork hole; *c*, cork; *d*, part of the arm: the other end of the instrument will be similar in form. One of these 30 hollow vessels will of course be made all of zinc, but the other for the sake of economy may be made one side of copper, and the side only that is to come in contact with the skin need be of silver: the figure of this silver side being the face of the instrument must be accommodated to the part of the body on which it is to operate. The form shewn in Figure 4 is suitable for being 35 applied in the armpits for electrizing the heart and lungs, the copper sides being covered with cloth to keep them from touching the arms of the patient. The arms of the instrument must be long enough to reach across the breast of the patient.

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Fig. 5 shews part of a similar instrument to Fig. 4, but with the addition of a conical nozzle with a hemispherical end projecting from the middle of the face, of dimensions proper to be inserted into the orifice of the ear of the patient; the projection from the zinc vessel will be of zinc, the body of the
 5 other vessel may be all of copper, and the projection only made of silver, since no other part is to come in contact with the ear; the copper may all be covered with cloth to keep in the heat of the water for a longer time, and hinder the copper from touching the patient's skin. A, B, *a*, *b*, *c*, *d*, refer to the same parts as in Fig. 4; *e*, the nozzle. The arms of this instrument must
 10 be long enough to reach round the head of the patient.

Fig 6 represents a modification of the instrument applicable to the feet of the patient in bed, calculated to promote an electric circulation through both the lower limbs and through the bowels, stimulating them to action. A, face view; B, profile; (*a*), two small hollow vessels, one of copper and one of zinc,
 15 each about three or four inches diameter, and five or six inches long; *b*, two sockets or necks, through which the vessels are to be filled and emptied; *c*, corks; *d*, a piece of thick sheet copper or zinc, to the ends of which the water vessels are soldered, this piece forms the communication between the vessels, and at the same time causes this instrument to lie in bed with the faces
 20 towards the soles of the patient's feet *e*, a disc of silver and a disc of zinc, having blunt points formed on the outside, are soldered to the vessels to form the faces of the instrument against which the feet of the patient are to be placed: the silver disc is to be affixed to the copper vessel, and the zinc disc to the zinc vessel: all the instrument, except the two faces and the two cork
 25 holes, may be covered with cloth. In another modification of the instrument one long cylindrical vessel, say a foot long, and three or four inches in diameter, one half of its length copper, and the other half zinc, may have the two discs soldered on near the ends of the vessel.

Fig. 7 shews this modification. A, face view; B, end view; *a*, the water
 30 vessel; *b*, the cork hole and cork; *c*, the discs with blunt points; *d*, a block of wood affixed to the cylinder, and so placed that the instrument may lie in bed in a convenient position for the feet of the patient to be pressed against the faces of the instrument. The cylindrical figure of this vessel is of no consequence; it may assume various forms with equal effect.

35 Fig. 8 shews a modification in form of the instrument, convenient to be used on the abdomen, side, or other concave part of the patient. A, face view; B, profile; *a* half of the vessel made of copper; *b*, the other half, made of zinc; *c*, the cork hole and cork. *d*, the discs, with blunt points. The dimensions, proportions, and curvature of this instrument should be made

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nearly to fit the part of the body on which it is to be used. The instruments described under Figures 4, 5, 6, 7, and 8, will be generally made double the size of the Drawings. All the following Figures are drawn of full size; but the instruments will be made in practice larger or smaller, according to convenience.

Fig. 9 shews a modification of the instrument for electrizing the inside of the rectum. *a*, a cylindrical water vessel, half the cylinder being copper and the other half zinc; *b*, cock hole and cork; *c*, a hollow cylinder, termed the nozzle, half silver and half zinc, united longitudinally, open to the water vessel at one end, and closed hemispherically at the other end. This instrument being filled with water, heated to a temperature as much above the natural heat of the patient as can be comfortably endured, the nozzle is to be lubricated with oil or fat, and then inserted by a gently twisting motion into the rectum, which will generally be found in cases of constipation of the bowels to stimulate and augment the peristaltic motion mildly but effectually, so as to produce a speedy dejection of the fœces, without occasioning succeeding debility and the early return of costiveness, too often the consequences of cathartic medicines taken in the stomach. The form just described is convenient for use by a patient in a recumbent posture, but it may be accommodated to the sitting posture by enlarging the diameter of the water vessel to ten or twelve inches, and reducing the depth to one or two inches, and covering the same with a cushion having a hole in the middle for the nozzle to pass through.

Fig. 10 represents an instrument constituted of the nozzle of Fig. 9, united to a flanch, which may be employed in the rectum in cases where the heat of the body may be deemed sufficient to promote the galvanic action, without the aid of warm water. A, view of the instrument, formed of a piece of silver and a piece of zinc soldered together longitudinally; B, section of the same; C, view of another construction of the instrument, formed of alternate ferrules of silver and zinc; *s*, the silver; *z*, the zinc; *a*, the flanch to prevent the instrument from entering too deeply.

Fig. 11 represents a form of the instrument to be worn in the rectum for a considerable time without much inconvenience in a case of obstinate constipation, the neck of the instrument allowing the sphincter ani muscle to close upon it, and thus be relieved from the muscular tension which would be painfully felt if either of the instruments Figures 9 or 10 were continued long in use.

Fig. 12 shews a form of instrument by which the electric action within the rectum may be intermitted or continued at pleasure. *z*, the zinc tube and flanch called the nozzle; *s*, a silver cylindrical rod, with a hemispherical end

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sliding through the tube *z*; *a*, an adjusting ferrule and thumb screw to be fixed at any part of the outer end of the sliding rod to limit the distance of its protrusion through the nozzle. In using this instrument the tip end of the sliding piece is to be protruded a small distance through the nozzle, when
 5 after having been lubricated they are both together to be inserted into the rectum as far as the flanch will permit. The slider is then to be drawn outwards until its inner end shall come within the nozzle, so that the nozzle only shall be in contact with the interior of the passage, and thus that the galvanic action may be suspended. The action is again renewed by pressing
 10 the sliding piece inwards until its end protrudes through the nozzle and touches the inner parts of the passage; and thus, by alternately pressing in and withdrawing of the slider, a succession of slight galvanic shocks will be produced. The shocks may be limited to a deeper or shallower part within the passage by means of a sheath of ivory, mother-of-pearl, or other im-
 15 perfect conductor being placed over such part of the nozzle as may require to be held in a neutral state. The two metals may also be insulated from each other by means of a tube of imperfectly conducting material lining the whole length of the aperture of the nozzle, or the nozzle may be made with the inserting end of mother-of-pearl and the other end of zinc, by which means
 20 the alternate insultation and contact will be effected by the alternate withdrawing and pressing inwards of the sliding piece, until the ferrule comes in contact with the flanch.

Fig. 13 shews a form of the instrument for electrizing the intestines higher up than the rectum, without at the same time affecting the parts near the
 25 orifice. *a*, a tube and flanch to remain stationary in the rectum during the operation. This tube may be of metals, ivory, mother-of-pearl, or any other smooth and hard substance. *b*, a stem of whalebone, or other flexible material, sufficiently firm for the purpose, and being an imperfect conductor of galvanic electricity. This stem slides freely in the tube. *c*, a ball of half
 30 silver and half zinc, fixed on the inner end of the stem, to be inserted so far up the intestines as is convenient. Two, three, or more such balls may be fixed on the end of the stem, to increase the galvanic surface and strengthen the effect. *d*, a ring and socket, screwed on upon the whalebone for a handle.

Figure 14 represents another modification of the instrument, by which
 35 intermittent action may be effected within the rectum. *z*, a nozzle of zinc; *s*, a ball of silver and a neck of silver; *a*, a stem of whalebone; *b*, the handle; *c*, the adjusting ferrule or stop. In this instrument the alternations of galvanic action and of neutrality will be produced by drawing the sliding piece outwards until the silver neck comes within the end of and consequently in

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contact with the zinc nozzle, and then pushing the slider in again until the whalebone only is in contact with the zinc, the depth of intrusion in this case being also limited by the adjusting ferrule. Terminating balls of various diameters may be usefully employed in cases of stricture within the passage, and thus galvanic action may be combined with and aid the mechanical 5 operation.

Figure 15 shews an instrument in which great flexibility of the sliding piece is obtained, for the purpose of insertion high up the intestines, by making it of balls alternately large and small, strung upon a cord impregnated with caoutchouc, so as to render it very elastic and impermeable to fluids; the larger 10 balls to be half silver and half zinc, and of a size to fill up but pass easily through the tube or nozzle. The smaller balls, intended to increase the flexibility of the instrument, may be of any hard material, and about one third the diameter of the larger. The cord passing through a handle is tied to a ring, by which the operator may tighten the cord, and produce the 15 requisite degree of firmness for insertion into the tortuous passage, and by loosening the tension of the cord may allow the balls to remain in an unconstrained state, while they operate in producing continuous electric action. *a*, the nozzle and flanch. *b*, the handle, which is perforated for the cord to pass through; *c*, the electrizing balls; *d*, the intermediate balls; *e*, the cord 20 and ring.

Figure 16 represents a flexible slider for performing the same operation as the last described. It consists of a silver wire and a zinc wire, each of about one twentieth of an inch diameter, wrapped side by side around a cylinder of three eighths of an inch diameter, forming, when drawn off from the cylinder, 25 a helical spring of alternate coils of silver and zinc, the outside diameter of which will be about half an inch. The length may be from six to twelve inches, or more, according to the intended depth of insertion. A hemispherical cap of silver is soldered on to the inserting end of the spring, and a handle fixed on the other end. An instrument of the same kind as the 30 slider last described, made of suitable dimensions, is applicable to the stomach, and the galvanic action may be limited to any required part of the instrument, by covering the other part with a tube of caoutchouc, or a combination of thread and caoutchouc; and on the same construction, varying only in dimensions, may be made a catheter or bougie for insertion 35 into the bladder, to electrize the interior of that viscus. All the instruments herein-before mentioned as applicable to the rectum are also suitable for the vagina.

Fig. 17 shews an instrument of the same kind as Figure 16, but made

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about the size of the Drawing, the helical spring being conical instead of cylindrical, for the purpose of being inserted into the orifice of the ear. An ivory button covered with silk or velvet is fixed on the base of the cone, to assist in placing, in retaining, and in removing the instrument from the
5 orifice.

Figure 18, an ear instrument, formed of alternate silver and zinc balls, strung upon an elastic cord impregnated with caoutchouc. This cord is strained and fastened in the middle of a button similar to that described in Figure 17.

10 Another description of an ear instrument is formed of a nozzle and arm of silver, and a nozzle and arm of zinc insulated from each other by a piece of ivory or other imperfect conductor affixed to the end of the zinc arm, the ivory having a mortice through which the silver arm slides to vary the extent of the instrument according to the size of the head of the patient. The silver arm is
15 made very thin to give it sufficient elasticity that its end may, with a slight degree of force, be brought into contact with the zinc arm, and that the silver arm may, on the removal of the force, recover its position at a small distance from the zinc arm, and thus by alternate pressure and release an intermittent action is obtained, and by binding the two arms together a continued action will
20 take place.

Figure 19 represents this ear instrument. A, edge view; B, view of the inner side; C, two views of the nozzles separate from the arms, in order to shew the eyes or loops by which they are wedged to the arms; *a*, the silver nozzle; *b*, the silver arm; *c*, the zinc nozzle; *d*, the zinc arm; *e*, the ivory
25 piece; *f*, loops or eyes in the nozzles passing through holes in the arms; *g*, wedges driven into the loops to keep the nozzles firmly in the arms. It is obvious that the nozzles might be soldered to the arms, but the wedging of them in affords the facility of having several nozzles to one pair of arms. In using this instrument one of the nozzles is placed in one ear and the other
30 nozzle in the other ear, while the arms are bent to such a curve as will be conveniently around the head of the patient, and may be insulated from the head by a covering of cloth.

An instrument for administering the galvanic influence into the cavity of the navel, and fitted to be worn under the clothing, so as to produce a continued
35 action or a long succession of intermettent actions, is made of a nozzle and two arms insulated from each other by a piece of ivory or other imperfect conductor. Figure 20 represents one modification of the navel instrument of a convenient size for general use. A, view looking against the end of the nozzle. This side is distinguished by the term face, and the opposite side by the back of the

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instrument. B, edge view; C, back view; D, section lengthwise through the middle of the nozzle and of the arms; *a*, the nozzle formed of silver, ivory, and zinc; *b*, the ivory, *z*, the zinc arm, being a prolongation from the zinc part of the nozzle, and bending around part of the ivory, and secured to it by screws; *s*, the silver arm, also a prolongation from the silver part of the 5 nozzle bending around part of the ivory and overlapping the zinc arm, but not touching it until contact is effected by pressure on the outside of the silver arm, which arm must be sufficiently elastic to recover its position at a small distance from the zinc when the pressure is removed; *e*, small holes in the ivory by which straps may be sewn to tie the instrument around the body, *f*, screws to 10 secure the metallic parts of the instrument to the ivory part. When this instrument is tied around the body with the nozzle placed in the cavity of the navel, the patient can give himself any number of slight galvanic shocks by reiterated pressures against the silver arm, and this may be done either in a recumbent posture, or while sitting, standing, walking, or riding, by giving the 15 pressure through the medium of the waistcoat or other clothing, and he may produce a continuous effect by tying a bandage over the whole instrument to keep the silver and zinc in contact with each other.

Figure 21 represents another modification of the navel instrument, in which the silver arm is moved and the shocks given by the action of walking. 20 A, section lengthwise through the middle of the nozzle and the two arms; B, view of the face of the instrument; *a*, the ivory block; *z*, the zinc part of the nozzle with the arm; *s*, the silver piece, the arm of which is made thin and elastic; *d*, a hinge joint in the silver arm upon which the lower part revolves, in order to allow of its being turned up against the back of the 25 instrument when the patient wishes to sit; *e*, a padding sewed on to the lower end of the silver arm against which the thigh is to press in the action of walking. When the lower part of the silver arm is turned up against the back of the instrument the silver and zinc will remain in contact and produce a continued galvanic effect; but when the arm is turned down the padding will 30 lie against the thigh, the forward motion of which in walking will press the silver arm away from the zinc, and the arm will return again by its elasticity and lie against the zinc when the backward motion of the thigh takes place, and thus the intermittent effect will be produced.

Figure 22 shews a form of instrument for galvanizing both nostrils at the 35 same time. A, staple formed of a wire of silver and a wire of zinc, soldered together at the curved part; B, a staple formed of a silver wire and a zinc wire twisted together; C, a staple of two helical legs, made in the manner of the slider of Figure 16, and soldered to a curved wire. The legs of B may

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also be made, the one leg of two or more silver wires twisted together, and the other leg of two or more zinc wires twisted together, and the legs of C may, in like manner, be made the one of silver and the other of zinc.

Figure 23 shews a mode of supporting a pessary, and at the same time
 5 administering the galvanic electricity to the uterus in a case of prolapsus uteri. A, edge view ; B, side view ; *a*, a spherical pessary of gold or silver ; *b*, a supporter of zinc, having a hollow in the upper end to fit and receive a pessary ; *c*, holes through the stem of the supporter ; *d*, a pin to fit tightly into each of the holes *c* ; *e*, a strap with a slit in it to receive the stem of the
 10 supporter, upon which strap the pin *d* may rest and keep the pessary to the requisite height, regulated by the pin being placed in a higher or a lower hole of the stem. It is requisite to provide a non-galvanic supporter for the pessary to supply the place of the zinc one when the uterus is sufficiently electrized but yet requires further support. Ivory or mother-of-pearl may answer the
 15 purpose.

Figure 24 represents an instrument for producing either continuous or alternate galvanic action in the stomach, as may be deemed most beneficial. A, view ; B, section of the handle end of the instrument ; *s*, a helix of silver wire terminated by a hemispherical cap of silver soldered to the extreme coil ;
 20 this helix extends nearly the whole length of the instrument, and at about *f* it is soldered to a stem of silver, *s*¹, which may be tubular for the sake of avoiding weight in the instrument, this stem terminating in a ring *a* for the handle ; *b*, a collar sliding freely on the stem *s*¹, but may be fixed by the thumb screw *c* ; *c*¹, a tube of caoutchouc drawn over the silver helix and over part of the stem ; *z*, a
 25 helix of zinc covering the greater part of the tube *c*, *c*¹, extending to and united by soldering with the flanch *d* ; *e*, *f*, a tube of caoutchouc or a braided tissue of thread and caoutchouc covering the greater part of the zinc helix. The part of this instrument from *s* to *e* of view A being introduced into the stomach, an intermittent action is effected by alternately sliding the ferrule *b*
 30 against the flanch *d* and withdrawing the same, and a continued action will be kept up by fixing the ferrule on the stem in contact with the flanch.

An instrument to be worn on the head in the manner of a cap, with the metal inwards, for the cure of rheumatism and other diseases of that part, is formed of spangles or small discs of silver or plated copper and
 35 zinc overlapping one another sewed on to the silk, linen, or other cloth. Figure 25 represents a portion of such a cap, or a piece which may also be usefully applied to any other part of the surface of the body, its dimensions being proportioned to the parts on which it is to be used. *s*, silver ; *z*, zinc ;

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c, cloth. A greater number of small galvanic pairs may be formed by weaving a tissue with the warp of silver or plated copper wire, and weft of zinc wire, or the weft of silver and the warp of zinc, a piece of which tissue when pressed on the skin will create tension of the cuticle, and favor the transmission of the galvanic influence to the nerves. A tissue formed by 5 platting zinc and silver wire together would produce similar effects, and a still greater number of smaller galvanic pairs are obtained by cementing a mixture of the filings of silver and the filings of zinc in about equal proportions upon a piece of linen or other cloth; many cements or varnishes will answer, but that which I prefer is made of one part borax and 5 parts 10 shell-lac dissolved by boiling in water to a sufficient consistence to be laid on smoothly, and not to soak through the cloth. This cement or varnish is laid with a brush quite hot upon the cloth, and the mixture of silver and zinc filings immediately sifted on upon the surface of the varnish while in the state of adhesiveness, and before it becomes chilled. An electrifying plaster thus 15 made, on being bound tightly upon the skin, will press with an indefinite number of fine points upon the cuticle and render it transmissive of the galvanic influence to the nerves in a nearly insensible but yet beneficial degree. In order to render the application of the galvanic influence more sensible the cuticle may be punctured by an instrument in which a convenient number of 20 needle points or short pieces broken off from the pointed ends of fine sewing needles, say, from a score to a hundred, are fixed into a steel spring, which spring shall press the needle points through a thin plate of metal, perforated with as many holes as there are needle points, through which 25 holes the respective needle points may freely pass, and protrude about the one hundredth part of an inch beyond that surface of the plate which is opposite to the surface against which the spring presses. Figure 26 shews this puncturing instrument in four different views. A, view of the under side of the instrument, or that side which is to be laid against the skin in use; B, plan or view of the upper side; C, edge view of the instrument 30 in a state of preparation for making the punctures; D, edge view of the same after having been discharged and having made the punctures. The small letters following refer to all the four views. *a*, the plate of metal with a number of holes perforated at one end and a handle at the other end; *b*, the spring screwed down upon the plate at the one end, and having a projecting 35 knob at the other by which it may be lifted; *c*, the screw to secure the spring to the plate; *d*, the projection by which the spring may be lifted; *e*, a bridge screwed upon the plate *a*, to guide the spring laterally and prevent its being

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lifted up so high as to injure its elasticity; *f*, the needle points put through from the upper side of the spring into taper holes in which they fit tightly; *g*, a plate screwed upon the upper side of the spring to keep the needle points firmly in their holes; *h*, a spring bolt affixed to the bridge *e*, to catch under a
5 projection of the plate *g* and hold up the spring in preparation for making the punctures; *k*, a small bridge screwed upon the larger bridge, to guide the bolts; *l*, a knob on the bolt by which it may be drawn back to set the main spring *b* at liberty; *m*, a regulating screw in the middle of the plate *g*, to pass through the spring and press on the plate *a*, in order to determine the
10 distance that the needle points shall protrude. In using this instrument for puncturing the cuticle, the end of the spring containing the needles is to be lifted up until it is caught and held up by the bolt; the under side of the main plate is then pressed upon the spot of the cuticle to be punctured, and the bolt drawn back by the knob, by which operation the main spring will be set
15 at liberty, and will suddenly and forcibly collapse and pass the needle points through the cuticle, the regulating screw preventing a greater depth of puncture than is desired.

And I do further declare that for the sake of avoiding repetitions, and for the more clearly describing of the several instruments for administer-
20 ing galvanic influence herein-before shewn and explained, various dimensions are stated; but it is obvious that those dimensions must be altered, increased, or diminished according to the formations, ages, and constitutions of the patients, and the magnitudes of the localities to which the respective instruments are to be applied. The dimensions of the Drawings
25 will be generally suitable, taking Figures 1, 2, and 3, and Figures 9 to 25, as drawn to about the full size, and Figures 4, 5, 6, 7, and 8 to about half the size of the instruments. For similar reasons also silver, zinc, and copper only have been mentioned, although other metals or metallic compounds, by which the galvanic influence is excited, might sometimes be substituted; and when
30 ivory, whalebone, or mother-of-pearl is named, it should be understood that any other imperfect conductor might be employed.

And I do lastly declare that I lay no claim to any of the modes of exciting and applying galvanic influence or voltaic electricity which have heretofore been employed, such as galvanic batteries or voltaic piles,
35 excited to powerful action by being immersed in wetted or moistened with acidulated fluids, connected by wires, and such as pairs of plates connected by wires, or a piece of silver and a piece of zinc held over and under the tongue, or such as chains of alternate links of different metals,

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or such as a mere string of beads of alternate metals worn around the neck or other part of the body; but I restrict my claim to the invention of the instruments herein-before shewn and described, brought into action by the natural fluids of the body.

In witness whereof, I, the said John Isaac Hawkins, have hereunto 5
set my hand and seal, this Thirteenth day of September, in the year of
our Lord One thousand eight hundred and thirty-four.

JOHN ISAAC (L.S.) HAWKINS.

AND BE IT REMEMBERED, that on the Thirteenth day of September,
in the year of our Lord 1834, the aforesaid John Isaac Hawkins came before 10
our said Lord the King in His Chancery, and acknowledged the Specification
aforesaid, and all and every thing therein contained and specified, in form above
written. And also the Specification aforesaid was stamped according to the
tenor of the Statute made for that purpose.

Inrolled the Thirteenth day of September, in the year of our Lord One 15
thousand eight hundred and thirty-four.

LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1857.

FIG. 2.

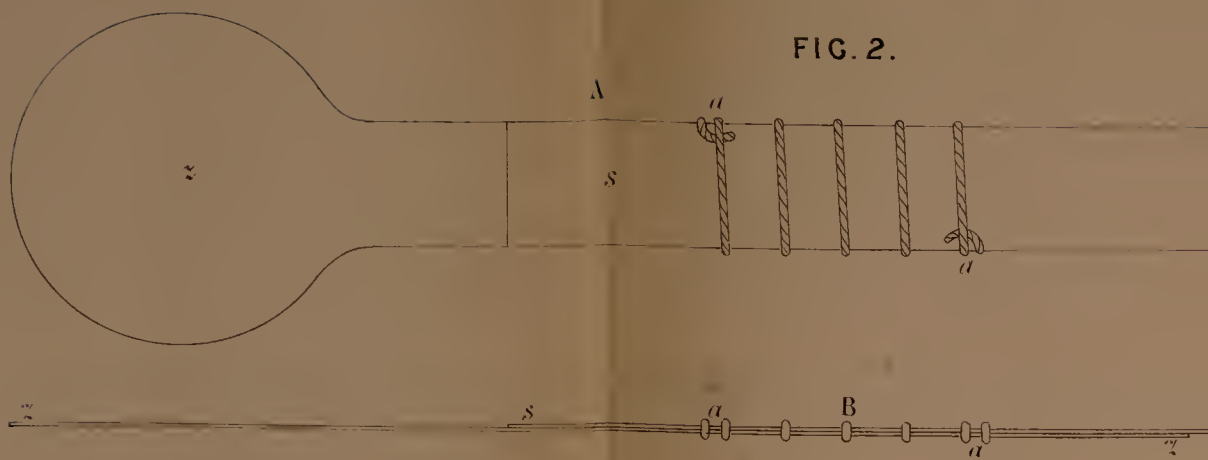


FIG. 3.

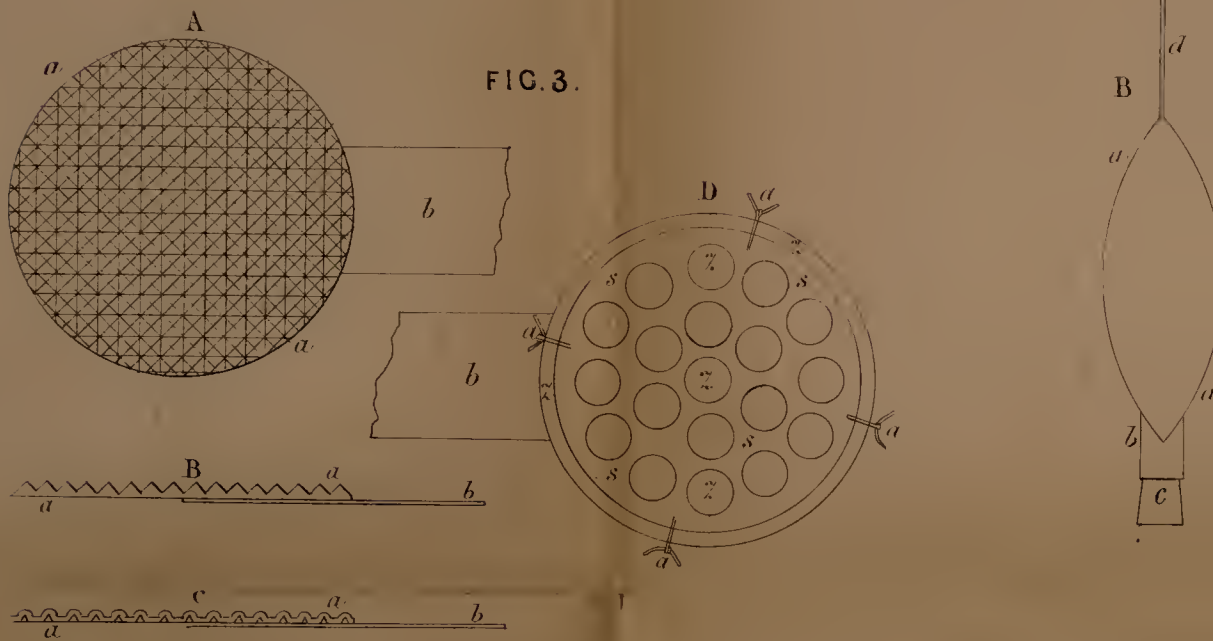


FIG. 5.

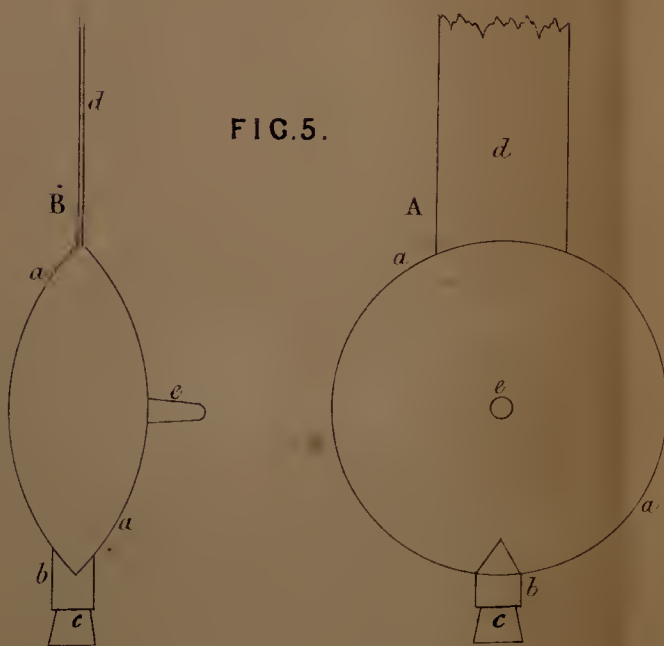
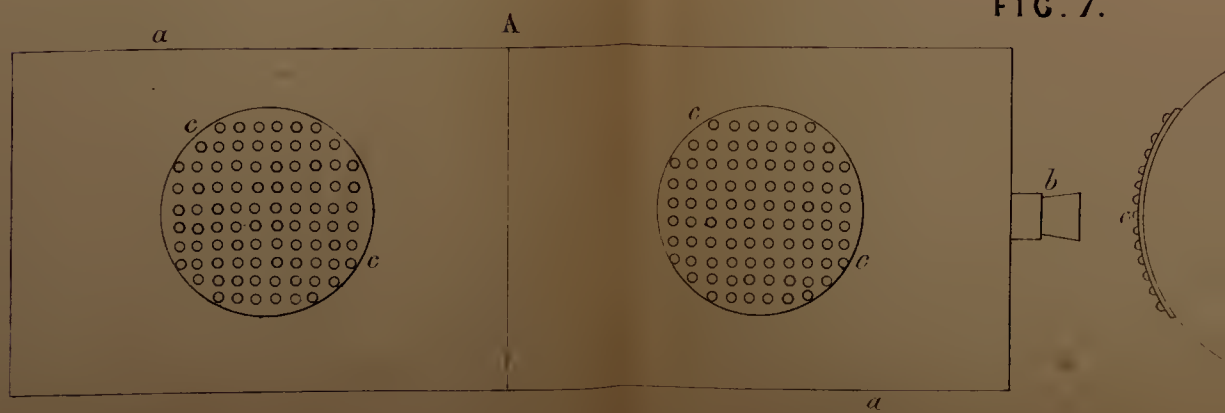


FIG. 7.



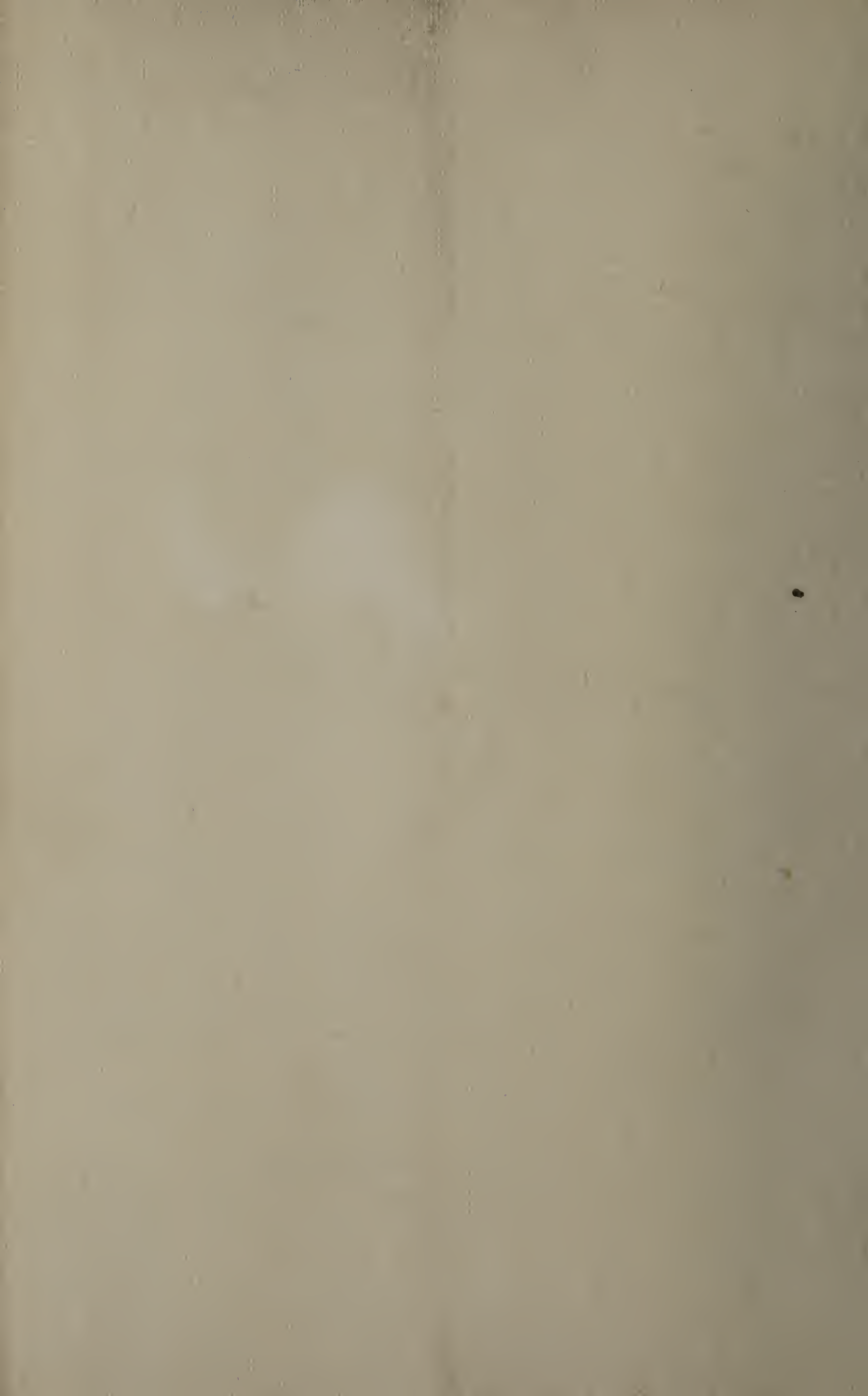


FIG. 15.

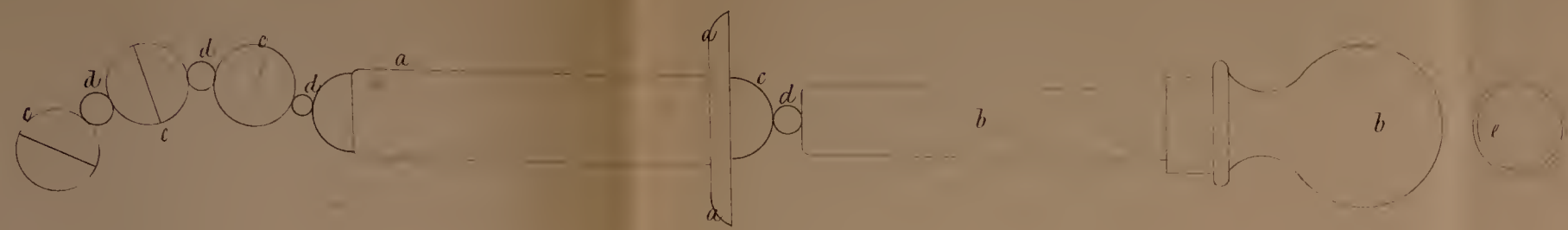


FIG. 22.

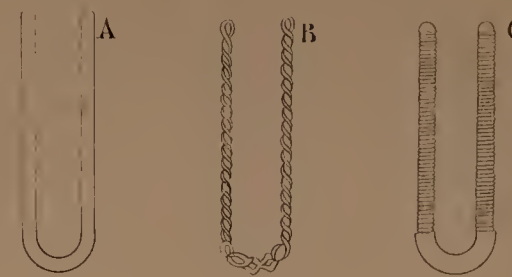


FIG. 25.

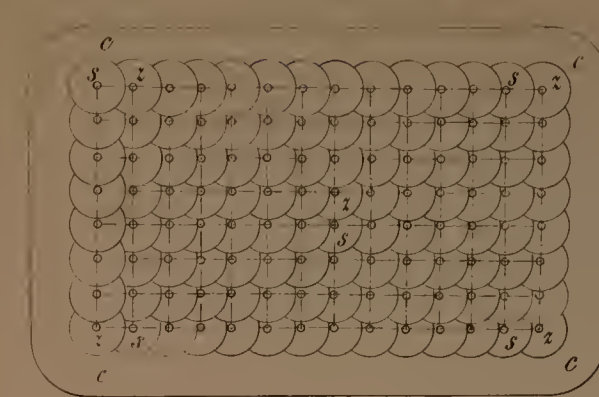


FIG. 16.

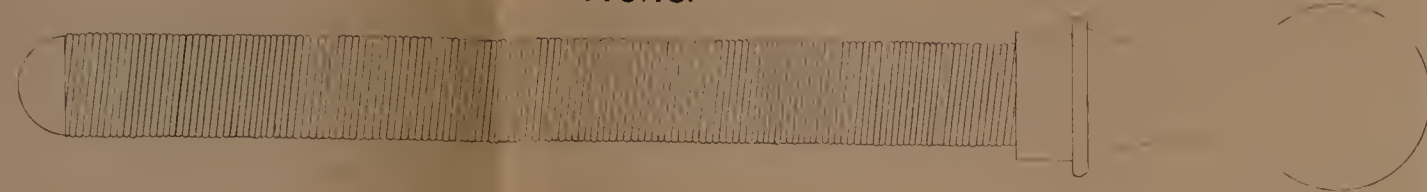


FIG. 21.

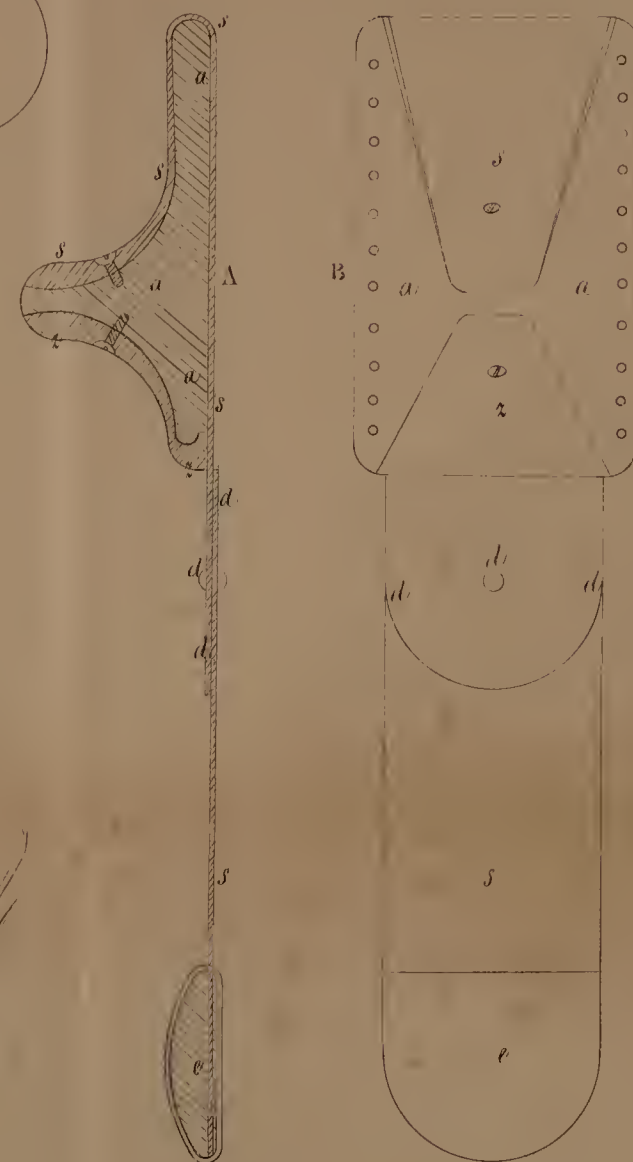


FIG. 17.

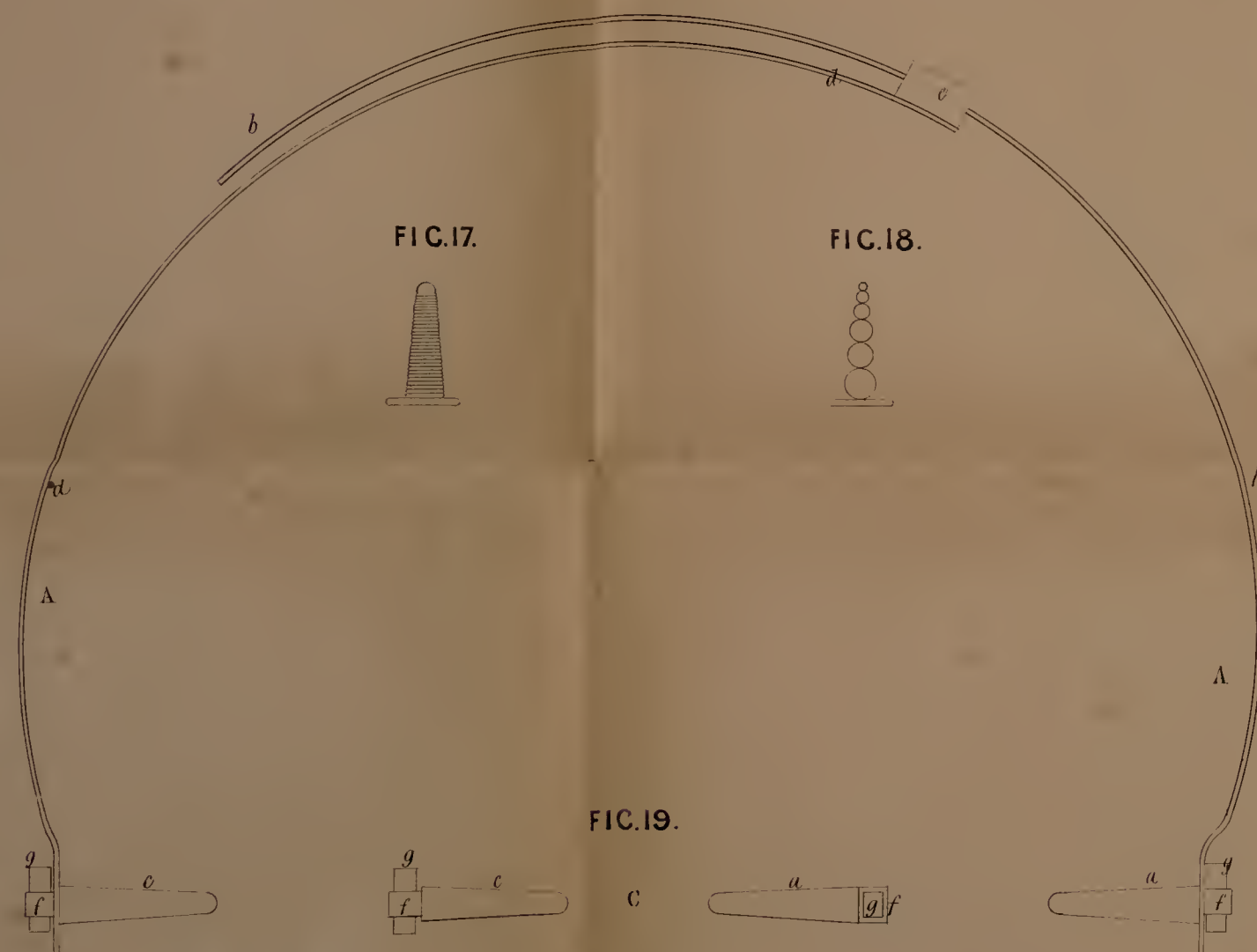


FIG. 18.



FIG. 19.

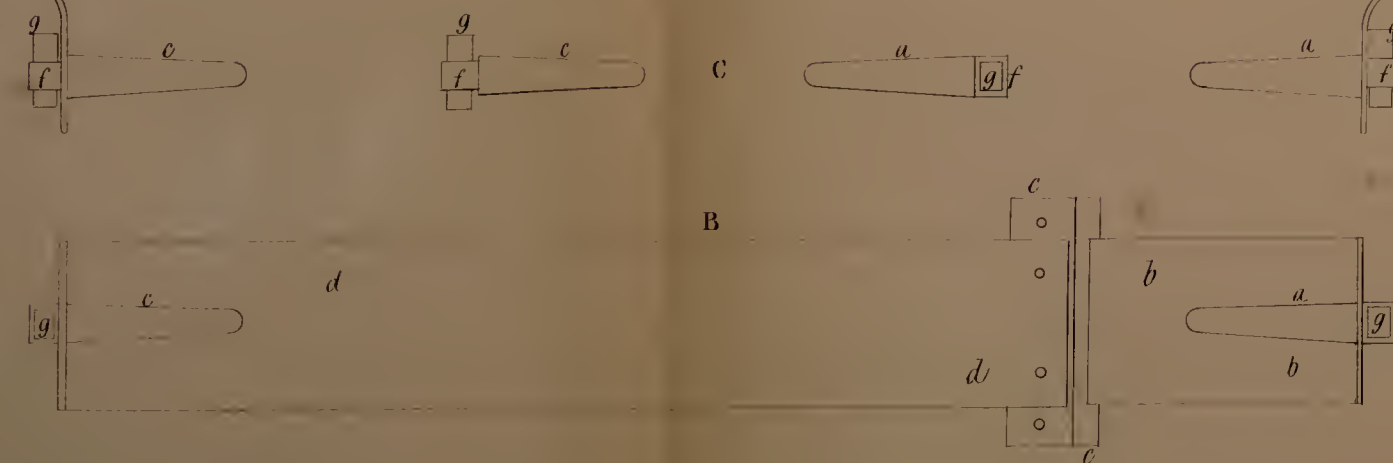


FIG. 23.

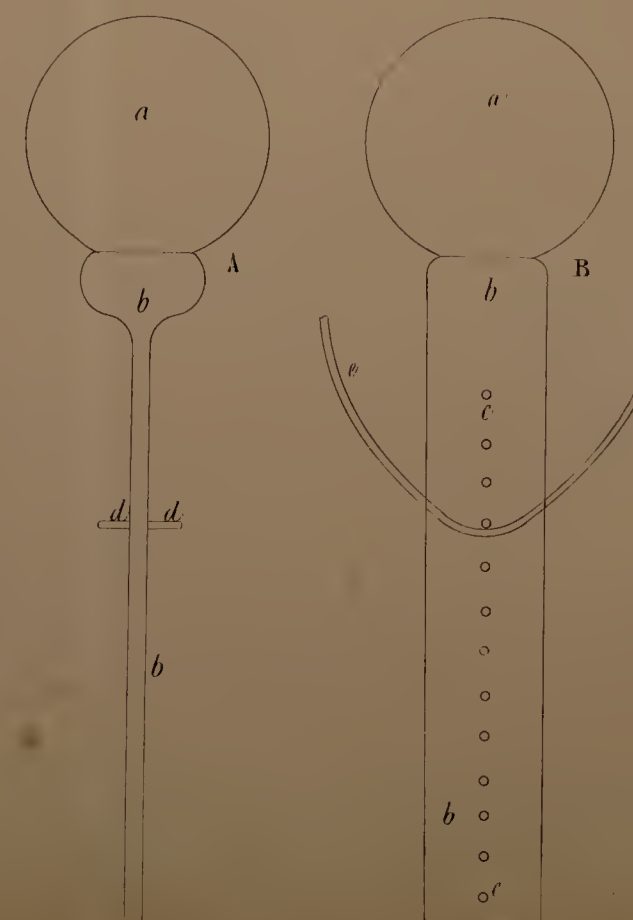


FIG. 24.

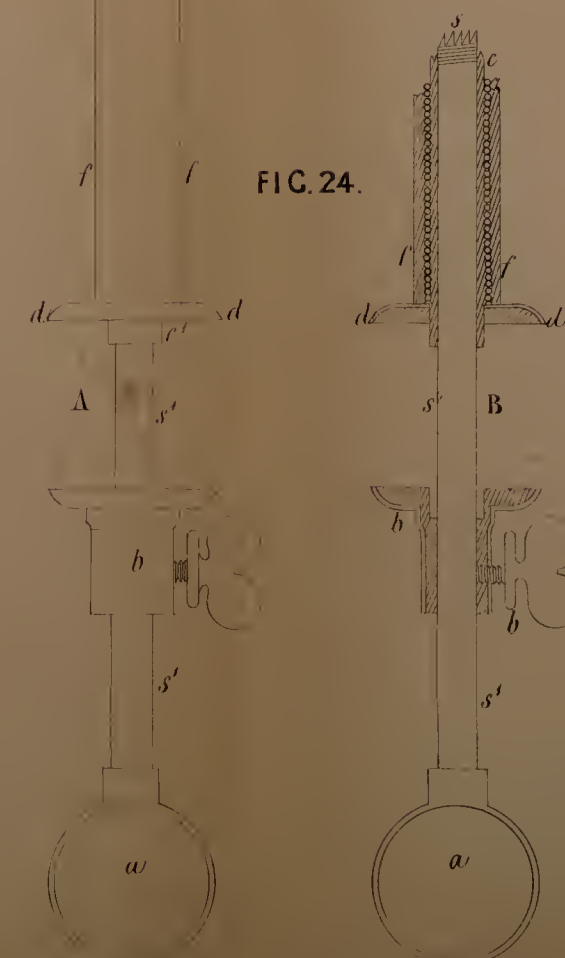


FIG. 20.

